

# **COOLING APPARATUS WITH A FRONT LOADED AXIAL FLOW FAN**

## **BACKGROUND OF THE INVENTION**

### **1. Field of the Invention:**

5           The present invention relates to a cooling apparatus for use in a computer and, more particularly, to a cooling apparatus with a front loaded axial flow fan, which has an axial flow fan transversely located on the front side for dissipating heat from the computer efficiently.

### **10   2. Description of the Related Art:**

          In a computer, as shown in FIG. 1, a number of fans 20a may be installed in the computer case 10a to dissipate heat from the heat source inside the computer case 10a.

          Further, an information product, for example, a server or  
15   industrial computer provides a strong operation and processing functions. Consequently, it requires quick dissipation of heat. In order to dissipate heat from the computer case 10a, the number of fans 20a should be relatively increased. It is not expensive to install a big number of fans in the computer case of a server or  
20   industrial computer.

## **SUMMARY OF THE INVENTION**

          The present invention has been accomplished under the circumstances in view. It is the main object of the present invention

to provide a cooling apparatus for a computer, which uses a transversely extended axial flow fan to dissipate heat from the heat source inside the computer efficiently. It is another object of the present invention to provide a cooling apparatus for a computer  
5 that uses a display panel to indicate detected Fahrenheit/Celsius temperature levels.

To achieve these and other objects of the present invention, the cooling apparatus with a front loaded axial flow fan comprises a housing, the housing having a receiving open chamber extended  
10 to a front side thereof. An axial flow fan is transversely mounted in the receiving open chamber inside the housing, the axial flow fan comprising a shaft connected to drive means, and a vane wheel mounted on the shaft, the vane wheel having a plurality of vanes around the periphery thereof. A display panel is mounted on the  
15 front side of the housing, the display panel having an LED display unit. A control circuit assembly is coupled to the axial flow fan and the LED display unit, and is adapted to detect the temperature of a heat source, to compare the detected temperature level with a reference signal, to drive the axial flow fan subject to the  
20 comparison result, and to drive the LED display unit to indicate the detected temperature level.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

Other objects, features and advantages of the present invention

will be more apparent from the following detailed description when read in conjunction with the accompanying drawings in which:

FIG. 1 is a schematic drawing showing a plurality of fans installed in the case of a computer according to the prior art;

5           FIG. 2 is an exploded view of a cooling apparatus with a front loaded axial flow fan according to the present invention;

FIG. 3 is an elevational assembly view of the cooling apparatus with a front loaded axial flow fan according to the present invention;

10           FIG. 4 is a circuit block diagram of the present invention;

FIG. 5 is a detailed circuit diagram of the present invention;

FIG. 6 is a schematic drawing showing the operation of the present invention; and

15           FIG. 7 is a circuit block diagram of the microprocessor of the cooling apparatus with a front loaded axial flow fan according to the present invention.

#### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

Referring to FIGS. 2-6, a cooling apparatus with a front  
20 loaded axial flow fan in accordance with the present invention is to be installed in the computer case 10 of a computer to dissipate heat from the computer. The cooling apparatus with a front loaded axial flow fan comprises a housing 1, a transversely extended axial flow

fan 2, a display panel 3, a thin sheet type air filter 4, a packing frame 5, and a grille 6.

The housing 1 has a receiving open chamber 11 extending to the front side, which accommodates a control circuit assembly (not shown). The transversely extended axial flow fan 2 is mounted in the receiving open chamber 11 inside the housing 1, comprising a shaft 23 and a vane wheel 21 mounted on the shaft 23. The vane wheel 21 comprises a plurality of vanes 22 around the periphery. The display panel 3 is mounted on the front wall of the housing 1 in front of the receiving open chamber 11, comprising an LED display unit 31, which comprises an LED 188 display and light emitting elements for °C, °F, Hi, Lo indications, a rectangular opening 32 in one side of the LED display unit 31 corresponding to the receiving open chamber 11, and a Fahrenheit/Celsius selector switch SW at the bottom side of the LED display unit 31. The thin sheet type air filter 4 is mounted within the opening 32 of the display panel 3. The packing frame 5 is fastened to the display panel 3 to secure the thin sheet type air filter 4 in position, having an opening 51 corresponding to the opening 32 of the display panel 3. The grille 6 is mounted within the opening 51 of the packing frame 5.

The aforesaid control circuit assembly comprises a pulse wave reference circuit 12, a temperature detection circuit 13, a Fahrenheit/Celsius detection circuit 14, a driving circuit 15, and a

control circuit 16. The pulse wave reference circuit 12 is a resistor R7. The temperature detection circuit 13 is a thermistor WR1 adapted to detect the temperature of the heat source. The Fahrenheit/Celsius detection circuit 14 comprises the aforesaid selector switch SW and resistors R9 and R12. The user can operate the selector switch SW to select Fahrenheit/Celsius as temperature units for display. The driving circuit 15 is electrically connected to the transversely extended axial flow fan 2 and adapted to drive the transversely extended axial flow fan 2, comprised of transistors Q1, Q3, Q4, diodes D1, D5, resistors R1, R3, R5, R8, capacitors C6, C16, and an inductor L1. The control circuit 16 comprises a microprocessor U1, a transistor Q2, resistors R2, R4, R62, and a capacitor C4, and respectively coupled to the pulse wave reference circuit 12, the temperature detection circuit 13, the Fahrenheit/Celsius detection circuit 14, the driving circuit 15, and the LED display unit 31.

The control circuit 16 compares the potential output from the temperature detection circuit 13 to the potential output from the pulse wave reference circuit 12, and then provides a pulse signal to the driving circuit 15 subject to the comparison result, thereby causing the driving circuit 15 to drive the transversely extended axial flow fan 2, or to control the LED display unit 31 to show the currently detected Fahrenheit/Celsius temperature level.

Referring to FIG. 7, the microprocessor U1 comprises a pulse wave comparator 71, a controller 72, a pulse bandwidth modulator 73, and a display control 74. The pulse wave comparator 71 is respectively coupled to the pulse wave reference circuit 12 and the temperature detection circuit 13, and adapted to compare the potential output from the temperature detection circuit 13 to the potential output from the pulse wave reference circuit 13. The controller 72 is respectively coupled to the pulse wave comparator 71 and the Fahrenheit/Celsius detection circuit 14. The pulse bandwidth modulator 73 is respectively coupled to the controller 72 and the driving circuit 15. The display control 74 is respectively coupled to the controller 72 and the LED display unit 31. The controller 72 receives an output signal from the pulse wave comparator 71, and drives the pulse bandwidth modulator 73 to send a pulse signal to the driving circuit 15 subject to the output signal from the pulse wave comparator 71, causing the driving circuit 15 to control the operation of the transversely extended axial flow fan 2. The controller 72 also receives signal from the Fahrenheit/Celsius detection circuit 14, and gives a signal to the display control 74 subject to the output signal from the Fahrenheit/Celsius detection circuit 14, causing the display control 74 to drive the LED display unit 31 to display the detected current temperature level in degrees Fahrenheit or Celsius.

During operation of the computer in which the cooling apparatus of the present invention is installed, hot air is sucked from the heat source inside the computer case 10 into the air input port. When the transversely extended axial flow fan 2 sucks hot air into the inside, the air input port of the transversely extended axial flow fan 2 is in a half-open status; however, the air output port of the transversely extended axial flow fan 2 is approximately fully open. Therefore, hot air is efficiently sucked into the transversely extended axial flow fan 2 and rapidly expelled out of the computer case 10.

As indicated above, the cooling apparatus of the present invention uses a transversely extended axial flow fan to dissipate heat from the heat source of the computer, and a display unit to indicate the current Fahrenheit/Celsius temperature in the computer, enabling the user to know the temperature status inside the computer.

A prototype of cooling apparatus with a front loaded axial flow fan been constructed with the features of FIGS. 1-7. The cooling apparatus with a front loaded axial flow fan functions smoothly to provide all of the features discussed earlier.

Although a particular embodiment of the invention has been described in detail for purposes of illustration, various modifications and enhancements may be made without departing

from the spirit and scope of the invention. Accordingly, the invention is not to be limited except as by the appended claims.